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Research and Development Strategy of the Finnish Rail Administration

FINNISH RAIL ADMINISTRATION

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SUMMARY

Research and development (R&D) activities of the Finnish Rail Administration (RHK) secure the competitiveness of Finland in international markets, ensure the market share of public transport, promote railway traffic, improve the efficiency of rail infrastructure management, reduce life cycle costs, call for innovativeness and extend know-how in this sector. R&D activities utilize the strengths of railways, such as environmental-friendliness and energy efficiency. R&D promotes the achievement of the strategic goals of RHK.

Research and development activities of RHK are lead by the director of the Rail Network Department. Work is coordinated in the R&D Group. Persons from all RHK departments participate in R&D activities. All persons in RHK follow extensively the national and international operations in their sector. The goal for the level of R&D activities is 2 % of the financing of basic rail infrastructure management (for example 7 million Euros in the year 2006).

This publication includes both the actual R&D -strategy of RHK and R&D -programme. The publication also deals with the changes in the operating environment. Railway markets are in a changing situation, new actors are in the market and, for example, service chains are getting longer and longer for RHK. In addition, the publication also examines the impacts of the strategic goals of RHK on the focus of R&D activities. The goals include competitiveness and safety of railway traffic, management of the environmental impacts of rail operations, sufficient financing for rail infrastructure management and efficiency of operations as well as know-how in the rail sector. Furthermore, rules for the progress of research projects are dealt with. In addition to the actual development work, the essential activities include the implementation and utilization of results in all sectors. Also, the common R&D activities of the transport administration deserves an own chapter. R&D -programme of RHK for the years 2006–2008 is presented in the appendix of this publication.

Ratahallintokeskuksen tutkimus- ja kehittämisstrategia. Ratahallintokeskus, Rataverkko-osasto. Helsinki 2006. Ratahallintokeskuksen julkaisuja A 6/2006. 21 sivua ja liite. ISBN 952-445-149-2, ISSN 1455-2604.

TIIVISTELMÄ

Ratahallintokeskuksen (RHK) tutkimus- ja kehittämistoiminnalla (T&K-toiminta) varmistetaan Suomen kilpailukyky kansainvälisillä markkinoilla, taataan joukkoliikenteen markkinaosuuden säilyminen, edistetään rautatieliikennettä, parannetaan radanpidon tehokkuutta, pienennetään elinkaarikustannuksia, haetaan innovatiivisuutta ja laajennetaan alan osaamista. T&K-toiminta hyödyntää rautateiden vahvuuksia, kuten ympäristöystävällisyyttä ja energiatehokkuutta. T&K tukee RHK:n strategisten päämäärien saavuttamista.

RHK:n tutkimus- ja kehittämistoimintaa johtaa Rataverkko-osaston johtaja. Työtä koordinoidaan T&K-ryhmässä. T&K-toiminnassa on henkilöitä mukana kaikilta RHK:n osastoilta. Koko RHK:n henkilöstö seuraa laajasti oman alansa kansallista ja kansainvälistä toimintaa. Tavoitteena T&K-toiminnan tasolle RHK:ssa on 2 % perusradanpidon rahoituksesta (esim. v. 2006 noin 7 M €).

Tähän julkaisuun on nyt koottu sekä varsinainen RHK:n T&K-strategia että T&K-ohjelma. Julkaisussa käsitellään myös rautateiden toimintaympäristön muutoksia. Rautatieliikenteen markkinat ovat muutostilanteessa, uusia toimijoita on markkinoilla ja RHK:n kannalta esimerkiksi palveluketjut muuttuvat entistä pidemmiksi. Julkaisussa käydään lisäksi läpi RHK:n strategisten päämäärien vaikutus T&K:n painotuksiin. Päämääriä ovat rautatieliikenteen kilpailukyky ja turvallisuus, rautatietoiminnan ympäristövaikutusten hallinta, radanpidon rahoituksen riittävyys ja toiminnan tehokkuus sekä rautatiealan osaaminen. Lisäksi käydään läpi tutkimushankkeiden etenemisen pelisääntöjä. Varsinaisen kehitystyön lisäksi toimintaan kuuluu oleellisena osana tulosten implementointi ja hyödyntäminen kaikilla osa-alueilla. Myös väylähallinnon yhteinen T&K-toiminta ansaitsee oman kappaleensa. Julkaisun liitteenä on RHK:n T&K-ohjelma vuosille 2006–2008.

FOREWORD

Research and development activities (R&D) of the Finnish Rail Administration (RHK) promote railway traffic, improve the efficiency of rail infrastructure management, reduce life cycle costs, call for innovativeness and extend know-how in the rail sector. R&D supports the achievement of the strategic goals of the administration.

This publication also deals with the changes in the operating environment of railways and rules for the progress of research projects. In addition to actual development work, the essential activities include the implementation and utilization of results in all sectors.

This strategy and the related programme are compiled by the inter-departmental R&D Group, which is chaired by Mr. Markku Nummelin. R&D -programme presented in the appendix of this publication will be annually updated by the R&D Group.

Helsinki, September 2006

Finnish Rail Administration
Railway Network Department

CONTENTS

1 DEFINITION AND ORGANIZATION OF R&D IN THE FINNISH RAIL ADMINISTRATION

Research and development (R&D) signifies goal-oriented activities specified by the strategic goals of the Finnish Rail Administration (RHK) for promoting and utilizing knowledge. R&D activities secure the competitiveness of Finland in international markets, ensure the market share of public transport and promote railway traffic. R&D activities also improve the efficiency of rail infrastructure management, reduce life cycle costs, call for innovativeness and extend know-how in this sector. R&D activities consist of basic and applied research. RHK is not involved in product development, but supports product development projects of other organizations.

R&D promotes the achievement of the strategic goals of RHK. The R&D Group prepares the short term R&D -guidelines and estimates the need for financing. A Working Group consisting of the Management Group and directors of departments approves the project list for the budget year and the R&D budget along with the preparation of the budget. On report, the decision is made by the Director General.

The management of RHK evaluates annually the results of R&D activities before the preparation of the next budget. In the same context, it provides guidelines for possible changes in the focus of development.

R&D activities are lead by the director of the Rail Network Department. Preparation is made in the R&D Group which has participation from all departments. All persons in RHK follow extensively the national and international operations in their sector. Budgeting for R&D activities is made by departments. The goal for the level of R&D activities is 2 % of the financing of basic rail infrastructure management (for example 7 million Euros in the year 2006). A process description has been prepared for R&D activities.

2 CHANGES IN THE OPERATING ENVIRONMENT FROM THE VIEWPOINT OF R&D

Changes in the rail sector will also directly affect the R&D activities of RHK. Figure 1 shows the role of RHK in the changing operating environment. The following chapters clarify the impacts of market situation, new actors, cooperation and developing technology on the situation.

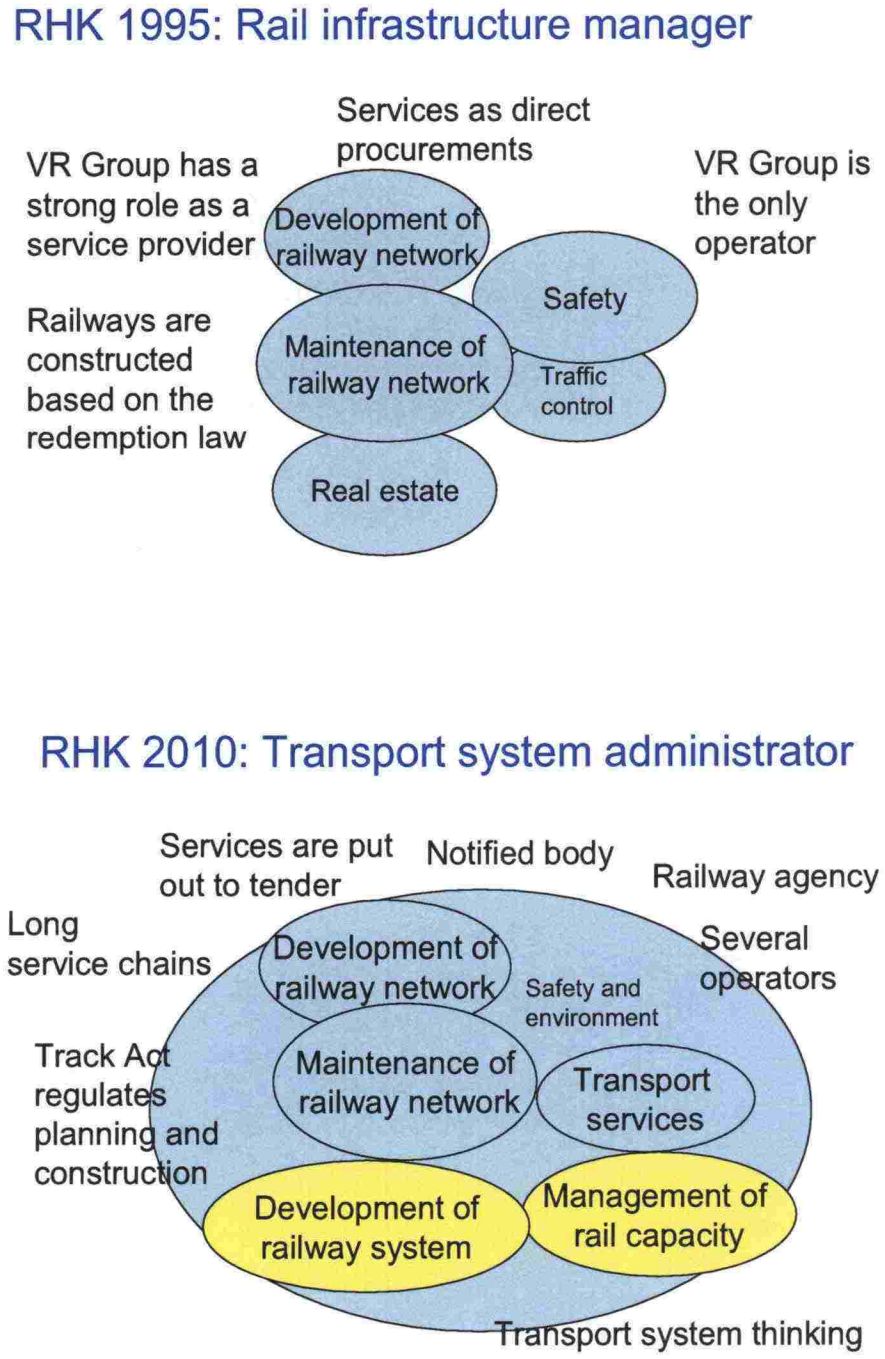

Figure 1. The Finnish Rail Administration operates in changing environment. A distinctive feature is the extensive purchase of services, when service chains may become long. The number of actors and rules regulating operations is also increasing.

2.1 Railway market is changing

The **domestic market** for railway freight transport **will open** on 1.1.2007. It is estimated that in the year 2012 there are 2 big actors and 2–6 small actors in the market in addition to VR Cargo. The market share of new operators is about 8 %. Operators need different services from RHK. New operators also need own special know-how of railway traffic.

The market for passenger traffic will probably open when the service contract regulation will be approved by the EU approximately in the year 2010. Through the service contract regulation, the purchasers of transport services (the Helsinki Metropolitan Area Council, the Ministry of Transport and Communications) will become applicants for rail capacity. The Ministry of Transport and Communications is also taking control over the rail **cooperation with Russia,** which has so far been managed by the VR Group on behalf of the state.

The above mentioned changes denote that know-how of railway traffic at operational level should also be possessed by other organizations than the current operator. The greatest pressure is directed towards the Finnish Rail Administration.

RHK must be able to foresee the needs of transport customers and operators so that the railway network can be developed to meet the demand. Instead of the knowledge gained from the operator, analyses must be performed independently. Capacity allocation also requires know-how from RHK on the planning of track use in the whole railway network and especially at railway stations. The Ministry of Transport and Communications also needs the support of RHK in the issues of the rail sector, as it does not have experts in this field.

2.2 New actors and increasing cooperation

The Railway Agency, which will start its operations in the year 2006 and which is responsible for railway safety and, for example, standard operations, is small (70 people, 35 of which are ticket inspectors). The personnel will come from existing rail organizations which, in turn, will demand new personnel. Cooperation between rail organizations is necessary and profit making is based on networking. Also, the notified body with approval processes will provide significantly more work to all actors.

Common development regarding transport system issues has been significantly increased both between the offices in the administrative sector of the Ministry of Transport and Communications and also more widely, and activities are expected to continue or even increase. Furthermore, the level of demand of the society will increase. Planning is even more interactive and regulated, but environmental and safety demands will also grow.

The Track Act will change the rail construction process to demand even more planning, as planning should proceed simultaneously with zoning. The Railway and Qualifications Acts will bring their own input to the qualifications in the future.

2.3 Longer service chains and more technology

The planning and contracting markets should be operational. Main realizers use several subcontractors or planners. In addition, RHK relies more and more on builder and management consultants. The management of service chains (procurement processes, contracts, responsibility issues, supervision) should be taken in better control by increasing resource allocation.

Railway related technology will increase with automation. Systems require high reliability. Procurement, operation and maintenance processes must be controlled well. With increasing speed levels the need for know-how of traditional railway technology will also be emphasized. Furthermore, safety must be secured by all operations.

3 IMPACT OF THE STRATEGIC GOALS ON THE FOCUS OF R&D

The Management Group of RHK has defined five strategic goals to guide the operations of the administration.

Competitiveness of railway traffic

Railway traffic has the preconditions to operate competitively and efficiently as part of the national and international transport system.

Safety of railway traffic

Safety of railway traffic is at the top European level.

Management of environmental impacts in rail operations

Emissions from traffic are reduced by enabling that the market share of railway traffic can grow. Environmental hazards of rail operations will be mitigated.

Sufficient financing for rail infrastructure management and efficiency of operations

We contribute to the fact that financing for rail infrastructure management meets the needs of transport and financing solutions enable long-term planning of operations. We develop our own activities and activities in the rail sector by efficient production and setting priorities to the measures of rail infrastructure management.

Know-how in the rail sector

We maintain and develop our know-how in the rail sector which provides opportunities to more efficient operations and changing the needs of the society to measures implemented by railway traffic.

The themes of R&D activities for the next five-year period will be selected so that they support the achievement of strategic goals. When RHK considers to participate in research initiated by other organizations, it must be checked that the results of this research are also focused to support these goals.

Figures 2 and 3 show that our R&D activities have wider significance also from the viewpoint of the development and continuity of know-how in the rail sector. R&D activities are especially significant as the basis for the guidelines and standards of RHK – renewal of guidelines is mainly based on research and studies.

Figure 2. R&D activities of the Finnish Rail Administration extend knowledge and provide more experts.

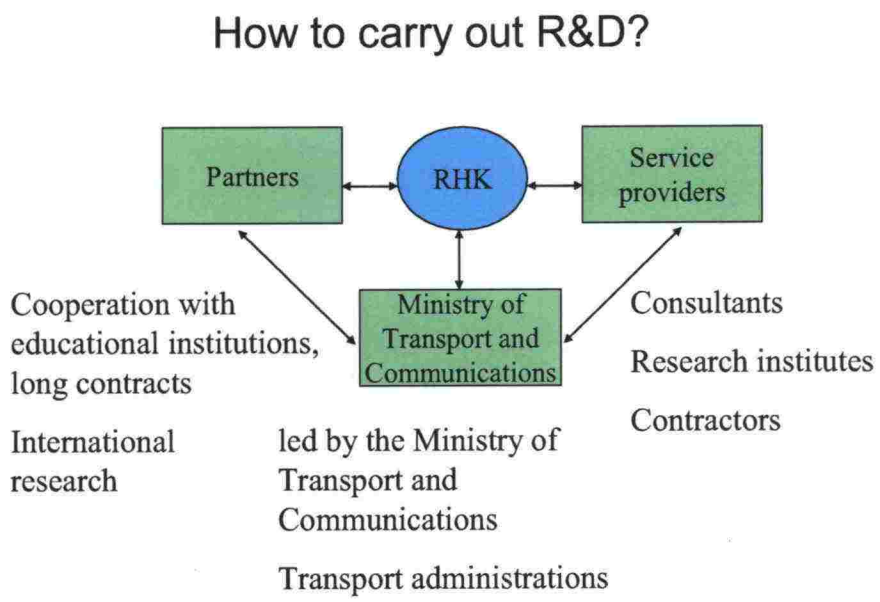

Figure 3. Choices of partners in R&D activities affect the development of know-how in the rail sector.

RHK acts in interaction with different parties. Due to the selected operating model, the relationship to **service providers** is especially important. RHK is responsible for functioning relationships, and the fact that service provider markets operate on sound basis. There should be a sufficient number of competent service providers. Having the service providers to do research will also extend their know-how on the subject. It is essential to take care that the know-how of RHK's personnel will also increase. In other

words, at least one person from RHK should be engaged in the work, who will also adopt the research results to work and deliver the results to other persons in RHK.

Cooperation with educational institutions is motivated by extending the know-how in the rail sector (basic research-type based on free guidance). It is essential that persons from RHK are involved in guiding and motivating and teaching staff constantly takes part. In this way, their know-how will also increase and they get subtlety in their teaching work. New competent experts in the rail sector are entering the labour market.

Participation in international research projects will be carefully considered. Along with the European (EU) standardization, focus will be shifted from the UIC projects to Nordic and EU research projects. Only financial partnership cannot be argued for in any project. Similar to domestic projects, one person from RHK must be active in the project so that results can be utilized in the entire rail sector. In addition, active participation is necessary in the guidance of research so that the special characteristics of Finland will be considered. These include, for example, challenging weather conditions, single track lines, mixed traffic and different track gauge from Central Europe.

4 RULES FOR STARTING RESEARCH PROJECTS

The starting point is that only projects proposed in the R&D -programme will be started. This is, however, not always possible. When starting projects which are not proposed in the programme, it should be checked that

a) project supports any of the strategic goals of RHK
b) financing can be allocated from the R&D budget or from outside (for example the Finnish Funding Agency for Technology and Innovation).

R&D projects should mainly be put out to tender according to procurement instructions. Direct procurement should have a legal basis.

Common rules should be created for supplier-based projects. Regardless of the unit or department of RHK, external operations should be independent and predictable.

Impulse for starting a new project can develop in many different ways. It can either be considered along with the preparation of the annual project list or it must be started in the middle of the year.

1. RHK's own project

RHK's own project develops out of the need to get more information. The department, which initiates the project, prepares a description of the project, estimates the costs and allocates financing. The R&D Group checks if the project supports any of the strategic goals and includes the project in the programme.

2. Supplier's project

The active party in many significant new projects is usually the supplier. The relevant department checks the content, timetable, costs and, if needed, the realizer of the project. If the project is not included in the previously agreed project list, the project will be discussed in the R&D Group before making contracts and commissions.

Potential projects, which support the goals of RHK, are favoured. The company has the responsibility for product development and related costs.

3. Common projects

Consideration is used in projects, which have several suppliers and financers. In some situations, decisions must, for example, be made before the R&D Group has a meeting. In these situations, both the R&D Group and the director of Rail Network Department must be informed as early as possible and to sufficient extent about the needs of the project. These cooperation projects should be prepared for in financing.

In addition, for example the cooperation and representatives with the Ministry of Transport and Communications must be agreed on (coordination of research work). It is important for RHK to be actively involved when the R&D -guidelines for the administrative sector are discussed.

5 RULES FOR PUBLISHING RESULTS

All research results must be delivered to be utilized and they must be available to those who might need them. The minimum requirement is that all significant results will be informed about in the extranet of RHK. It must be looked after already in the starting phase of research that publishing is included in the research plan.

Depending on the scope and interest of research, other channels of publication are selected, which can include

a) research publication (physical and electronic)
b) article in a professional journal
c) presentation in a domestic or international conference.

Through efficient implementation of results, both the development in the sector and internal efficiency and benefits of R&D activities are secured.

6 COMMON R&D IN THE TRANSPORT ADMINISTRATION

The Ministry of Transport and Communications is preparing (autumn 2005) the R&D - strategy 2006–2011 of the administrative sector. Draft of the strategy has been reviewed by the management of the Ministry of Transport and Communications and transport administrations during October-November.

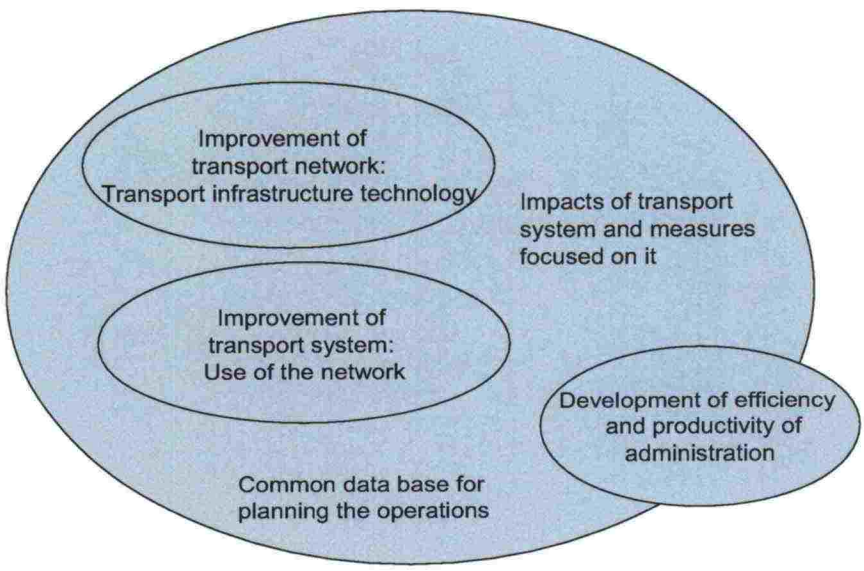

Figure 4. Common themes of transport according to the draft R&D -strategy 2006–2011 by the Ministry of Transport and Communications (version 25.10.2006).

A common data base for planning the operations includes the themes for monitoring and predicting the operating environment as well as the themes for climatic change and adapting to this change.

There is constant and growing need for systematic monitoring of changes in the operating environment and looking for weak signals. The implementation of the transport system perspective requires even closer interconnection between monitoring and forecasting in the whole sector. The main targets in forecasting changes include traffic demand and related issues as well as technological development. International connections are emphasized in the work concerning the operating environment.

This is a common challenge to the transport administrations in different countries and partly similar solutions are needed. With regard to the national cooperation within the transport administration, research institutes have a special role in the implementation of national model and emissions research. The focus of cooperation in other administrations includes the definition of risk assessments and ways of action which especially concern road, rail and maritime administrations.

The impacts of transport system and measures focused on it have been divided into three sectors: transport economy, traffic safety and environment.

Transport economy includes the following items:
- socioeconomic profitability of transport infrastructure and public transport
- financing of transport infrastructure and public transport
- pricing of transport infrastructure and market regulation
- impacts of transport on national economy.

The main task is to produce data on transport economy for the above mentioned items. This requires continuous monitoring of the sector as well as performing and commissioning of studies. Through a research programme focused on transport economy, the know-how of the administrative sector and consultants can be maintained.

As a new sector, it is necessary to adopt the evaluation of the economic significance of public transport. Subjects in this sector include, for example, socioeconomic impacts of public transport which secures the basic level of service, impacts of public transport on regional economy, socio-economically efficient subsidy system of public transport and unprofitability problems of public transport.

Thus, in the prevention of accidents, those common risks and factors must be identified, contributing to which will lead to the best result for the whole system. In the system, these factors are usually related to
1) background and basis for mobility and traffic demand,
2) transport services and flows,
3) traffic behaviour,
3) actions of drivers and passengers,
4) vehicles and their features,
5) traffic management and control,
7) transport network and
8) regulation of mobility and transport, operations and its components.

By only affecting the direct reasons for accidents, safety cannot be efficiently improved any more in countries, which have a good level of traffic safety. The most important underlying risk factors and possibilities for affecting them should also be clarified. These factors are mostly included in the transport system itself, basic values of society, attitudes of users – motives – choices and management. The traditional model of safety work should still, however, be utilized even more efficiently.

The starting point is:
- Applying system thinking in safety work
- Affecting people and different groups of persons through social functions and norms
- Integration of safety operations in all functions related to mobility and transport as well as to decision making
- Continuous development of safe transport, know-how and readiness as well as professional skills
- Incorporating the demand for safe mobility and transport into social thinking, decision making and functions of single persons
- Renewing and making the management, processes and organization of safety work more efficient.

For achieving the environmental obligations and goals, transport policy focuses especially on the following research topics, which mitigate environmental and health hazards:

- Green house emissions and climate models of transport
- Improving the energy efficiency of transport
- Mitigation of noise emissions and problems of transport
- Mitigation of particle emissions of transport
- Development of risk analysis for environmental impacts of transport and estimate of the impacts of transport on the diversity of nature.

Improvement of transport system: use of the network constitutes of four items: transport chains, trip chains and mobility of people, transport network management and telematics.

The common focus of the whole transport sector is the efficiency of freight transport system. The efficiency of freight transport serves both economic and environmental goals. Considering the customer needs, efficient use of resources (transport infrastructure, vehicles, labour force, information) should be aimed at.

An action programme for strengthening the logistics position of Finland was published in June 2005. The sectors of development of the programme include
- know-how, innovativeness and utilization of technology
- markets, regulation and increasing dialogue
- connections and infrastructure
- international influencing and lobbying.

With regard to trip chains, the essential sectors of R&D are related to the development of information, accessibility for the disabled, pedestrian and bicycle traffic, tourist traffic and legislation. It is also important to study the travel behaviour of citizens and distinguish the factors behind mode choice.

Responsibility for the operation of the transport networks requires the acceptance of new, transport-emphasized thinking in the transport administrations as well as the development and adoption of methods and tools. The essential R&D -themes include:

- strategic operational goals of the transport networks
- optimal cooperation between the networks of different modes of transport and their operation
- service supply needed for achieving the strategic goals
- functional and quality requirements of the operational services of the transport networks
- implementation and procurement models of services
- effectiveness and total economic efficiency of services.

The strategic goal in telematics is that Finland will develop as an internationally interesting innovation environment of smart traffic. The core of the innovation environment is high-quality domestic know-how in telecommunications technology,

especially in wireless communications and mobile technology and their applications in the transport sector. Innovation environment will become concrete through national and extensive regional solutions. Through these solutions the information infrastructure and services of transport will be developed and implemented based on the above mentioned know-how aiming at products which meet the needs of users and are also valid for export. The implementation of the national innovation environment presumes extensive adoption of technology in vehicles and in transport infrastructure which, in turn, presumes, for example, the preparation of statutes and political decisions.

As a result of the implementation of the innovation environment, Finland will have cost-efficient equipment for the use of traffic management and demand control. In addition, travellers and suppliers will have access to the best possible real-time information on traffic conditions and available choices of modes and routes.

The development of smart traffic in the future can be seen as a potentially similar revolution as mobile communications have been during the past 20 years. The difference is that smart traffic utilizes, for example, the technology of wireless communications, censors, remote detectors and positioning, and is rather an application area than a development area of new technology. In the future, the volume of applications will be, however, globally almost comparable to mobile communications. It is also very probable that the innovation environment of smart traffic will, by its existence and application potential, lead to the development of new technological solutions.

Improvement of the transport network: transport infrastructure technology supplements for its part the INFRA 2010 -development programme, which consists of four groups of projects:

- Product model and data transmission, the goal of which is to develop data management during the life cycle of infrastructure.
- Operational models and procurement processes, the goal of which is to develop service systems related to procurement procedures.
- Life cycle know-how and eco-efficiency of infrastructure construction, the goal of which is to develop, for example, product approval procedures and development potential for new products.
- Know-how and innovation activities, the goal of which is to secure a sufficient number of competent employees in the sector.

The goal of the common R&D activities of the transport administrations includes the development of transport infrastructure markets and the management of project information, procurement practices, functioning requirements, productization and guidelines as well as the development of quality requirements, quality assurance and monitoring.

The development of efficiency and productivity of administration will be implemented by utilizing the synergy between the transport administrations, promoting market functions and competition as well as developing information systems, knowledge management and know-how.

7 FOCUS AREAS OF THE R&D -PROGRAMME 2006–2010

The following chapters describe the focus areas of R&D related to each strategic goal.

Competitiveness of railways

Railway traffic has preconditions to act competitively and efficiently as part of the national and international transport system.

Quality and efficiency of transport:
- development and distribution of analysis methods of capacity
- development of trip and transport chains, accessibility, information systems
- automated shunting
- new traffic control systems and centralized traffic control
- punctuality of railway traffic
- development of new business possibilities
- security of data transmission.

Rail structures and rolling stock:
- monitoring of structures
- interoperability between rail and rolling stock
- monitoring of rolling stock.

Safety of the railway system

RHK will develop methods and adopt systems, which promote the safety of railway traffic and rail works.

Passengers and level crossings
- development of level crossing and passenger safety
- development of perceived safety at stations (lighting, camera control etc.)

Safety of railway traffic
- continuous train control system (ETCS level 2)
- VAK
- side protection and drag shoe development work

Safety system
- risk assessments
- development of safety at construction sites
- development of monitoring systems
- safety plans (for example tunnels)

Management of environmental impacts in rail operations

Emissions from traffic will be reduced by enabling that the market share of railway traffic can grow. Environmental hazards of rail operations will be mitigated.

Prevention and abolishing of environmental hazards
- environmental protection (noise, vibration, contaminated soil, ground water protection, risk analyses)
- development of environmental safety
- preserving cultural heritage, for example, in connection with rail environment studies
- planning and development of rail environment

Sustainable development
- reduction of energy consumption
- life cycle of materials and environmental impacts

Sufficient financing for rail infrastructure management

The cost-efficiency of rail infrastructure management will be promoted by developing new analysis methods for planning, construction and evaluating railway network condition, participating in the preparation of technical specifications for interoperability (TSI) and projects promoting interoperability, developing procurement methods as well as optimizing the life-cycle costs of rail structures.

Data management and method development
- development of rail data (in wide sense)
- development of analysis methods for railway network condition and maintenance
- optimization of the life of existing rail infrastructure
- innovative planning and construction methods
- development of procurement methods (contracts)

Standards
- Affecting the content of technical specifications for interoperability (special considerations for Finland) as well as updating and harmonization of Finnish standards. Other projects promoting interoperability (for example STM, ERTMS/ETCS).

Know-how in the rail sector

RHK participates actively in the training of new experts in the rail sector and the development of technical know-how as well as the creation and promotion of cooperation networks.

Securing of continuity and the know-how of service providers
- commissioning of theses
- participation in the development of education and learning material
- creation of networks and further promotion of their development
- organization of educational forums
- communications (distribution of information)
- long-term agreements for cooperation with research and educational institutions
- utilizing national and international research programmes.

APPENDIX 1

R&D -PROGRAMME 2006–2008

1 Competitiveness of railway traffic

Quality and efficiency of traffic

- Diagnostics of switches
  The purpose of study is to examine in advance the utilization of monitoring the switching time in maintenance.
- Axle-gauge changeover point
  Axle-gauge changeover point in Tornio has been taken in use in October 2005. Regular traffic through the changeover point is estimated to start in early 2006. Changeover point provides smoother and faster traffic operations between Finland and Sweden, since transhipment is not needed.
- ETCS, STM
  Transferring to trans-European safety device system will enable shifting to continuous train control system, which will promote safety and add to capacity.
- Automated shunting
  The goal is to study the possibilities of reducing the needed resources for shunting through automation.
- Transporting large load spaces in the railway network (ECU)
  The goal is to promote the competitiveness of railways.
- Analysis methods for rail yard capacity
  Analysis methods will be developed based on empirical data. Methods are needed in the planning of rail yard investments.
- Development of centralized automated traffic control system
  The main task of the centralized traffic control system is smooth and flexible control of traffic and transmitting necessary information to other systems. Centralized control systems are developed separately from other systems. Special attention will be paid to securing reliable data transmission.
- Management of rail capacity
  Due to the opening of rail market, information systems and operating processes regarding the management of rail capacity must be developed.

Rail structures and rolling stock

- Affordable low-volume railway
- Rail-wheel-interoperability
  Measuring of the effective conicity according to the regulations of the TSI, Nordic cooperation.
- Increasing the speeds of Russian freight trains
- Railway embankments with critical stability
  The purpose of study is to examine the number and quality of railway embankments with critical stability (usually soft areas) and especially develop continuous methods of measurement for monitoring problematic sites.

APPENDIX 1

2 Safety of rail system

Passengers and level crossings

- Warning signals at level crossings

  The aim is to find "lighter" and more affordable signals to replace the existing half-barriers. Through the exemption order by the Ministry of Transport and Communications, so-called flashing lights at level crossings will be installed to low-volume private roads.

Safety of railway traffic

- LED-signals

  The purpose of study is to investigate the applicability of LED-technology to the rail environment. The benefits include minor need for maintenance, brightness and affordability.

- Side protection and development work of drag shoe

  The purpose of study is to examine different alternatives for implementing side protection and estimate risks in proportion to costs.

- Prevention of unauthorized rail crossings

  Locations have been studied through a questionnaire to locomotive drivers. A case will be selected and appropriate practical measures will be studied at the particular location for preventing unauthorized rail crossings.

- Euro-Interlocking

  Completing and checking the demands of signal boxes will secure the safety of operations. Using a trans-European basis will enable the harmonization of operating requirements, which will have a positive impact to competition.

- Wheel flat detector

  With regard to safety and also economy, it is reasonable to find a suitable model of wheel flat detector which can be used "automatically" for monitoring. The model should include the capability of measuring wheel loads. A wheel flat and axle measurement system has been installed for testing in Utti on 28.11.2005. Development work with testing will continue during the year 2006. Monitoring will be moved to the traffic control centre in Kouvola during the year 2006.

- Repairing of old tunnels and safety

Safety system

- Safety at rail construction sites

  Clarification of the division of safety responsibilities at rail construction sites and other issues to be considered for securing safety, when several actors are involved.

APPENDIX 1

3 Management of environmental impacts in rail operations

Prevention and abolishing of environmental hazards

- NordVib
- LITES II

  The purpose of study is to develop deep stabilization as a method suitable for vibration abatement.
- Noise abatement of rails
- Vibration impact of the Finnish 250 kN rolling stock

  The impact of rolling stock on vibration will be studied.
- VERIS
- Mapping of rail noise

Sustainable development

- Pine oil sleepers
- Research of alternative control measures of weeds
- Participation in the Infra 2010 -programme

4 Sufficient financing for rail infrastructure management

Data management and method development

- Technical research of concrete

  RHK participates together with e.g. the National Road Administration in the project dealing with concrete research and bridge repair guidelines (SILKO-guidelines) which is lead by the Technical Research Centre of Finland.
- Sustainable bridges

  International research project aiming at increasing and estimating the age and carrying capacity of existing railway bridges (EU Sixth Framework Programme)
- Joint action between bridge and earth

  Examines the impacts of bridge load and bridge movements against earth.
- Repair guide for culverts (RUMKO)
- Embankment plates
- Embankment width

  The purpose is to study the performance of existing width and slope of embankments and evaluate possible needs for changing specifications.
- Superstructures of level crossings
- Sliding plates of switches

  The purpose is to reduce environmentally hazardous lubrication.
- Development of operational reliability software
- Rail technical research
- Analyzing structural layers of rail using ground scanning

  The purpose is to study the use of ground scanning in systematic research of ballast.

- Development of analysis methods for rail condition
  Data on the condition of tracks, sleepers, switches and ballast. The system produces processed information from registers on the condition of the railway network for the support of decision making. Registers to be used include, for example, Minirapsu, Emma-measurement, ballast samples and rail works, such as supporting.
- Development of stabilization methods
- Rigid contact line
- Geotechnical calculation programmes (Geosuite)
  Development of geotechnical calculation programmes in cooperation with relevant consulting companies, universities and the Road Administration.
- Development of reporting systems of rail line inspection
  The purpose is to develop further the reporting model to better meet the demands of RHK and other organizations.
- Repairing of old pile cap structures
- Management of infrastructure costs
  Harmonization of the cost calculation of construction and maintenance in the sector, and systematic collection and utilization of cost data from planning to construction and maintenance.
- Inframodel 2
  Partial definition of data transmission between different planning programmes.
- Rock material
  Definition of the properties and quality requirements of especially crushed rock aggregate.
- Infra-RYL
  Preparation of common quality definitions for construction in the infrastructure sector.
- Standards
  Standard operations aim at clear and consistent world of standards, in which regulations and guidelines are clearly separated. Especially, technical rules and guidelines of railways (RAMO) are updated. The new agency may change this procedure later. Based on all R&D work, standards can be efficiently developed.

5 Know-how in the rail sector

Securing continuity and the know-how of service providers

- Safety device manual
- Level crossing manual
  Data on level crossings will be collected in one manual, which needs not to be constantly updated (for example types of level crossings, different warning device and their suitability to different types of level crossings etc.)
- Rail substructure and foundation - book

APPENDIX 1

- Rail planning guidelines

  Rail planning guidelines should be updated in accordance with processes and developed planning system.

- Rail data

  Rail data is developed by improving the quality of rail register data by e.g. providing instructions to actors in the rail sector. The usability of data will be improved by developing RHK's rail data service. In this service the data will be more easily available.

- Planning guidelines for safety device

  Guidelines include the planning of safety device especially concerning planners based on regulations and directions presented in the technical rules and guidelines of railways (RAMO).

- RailLexic

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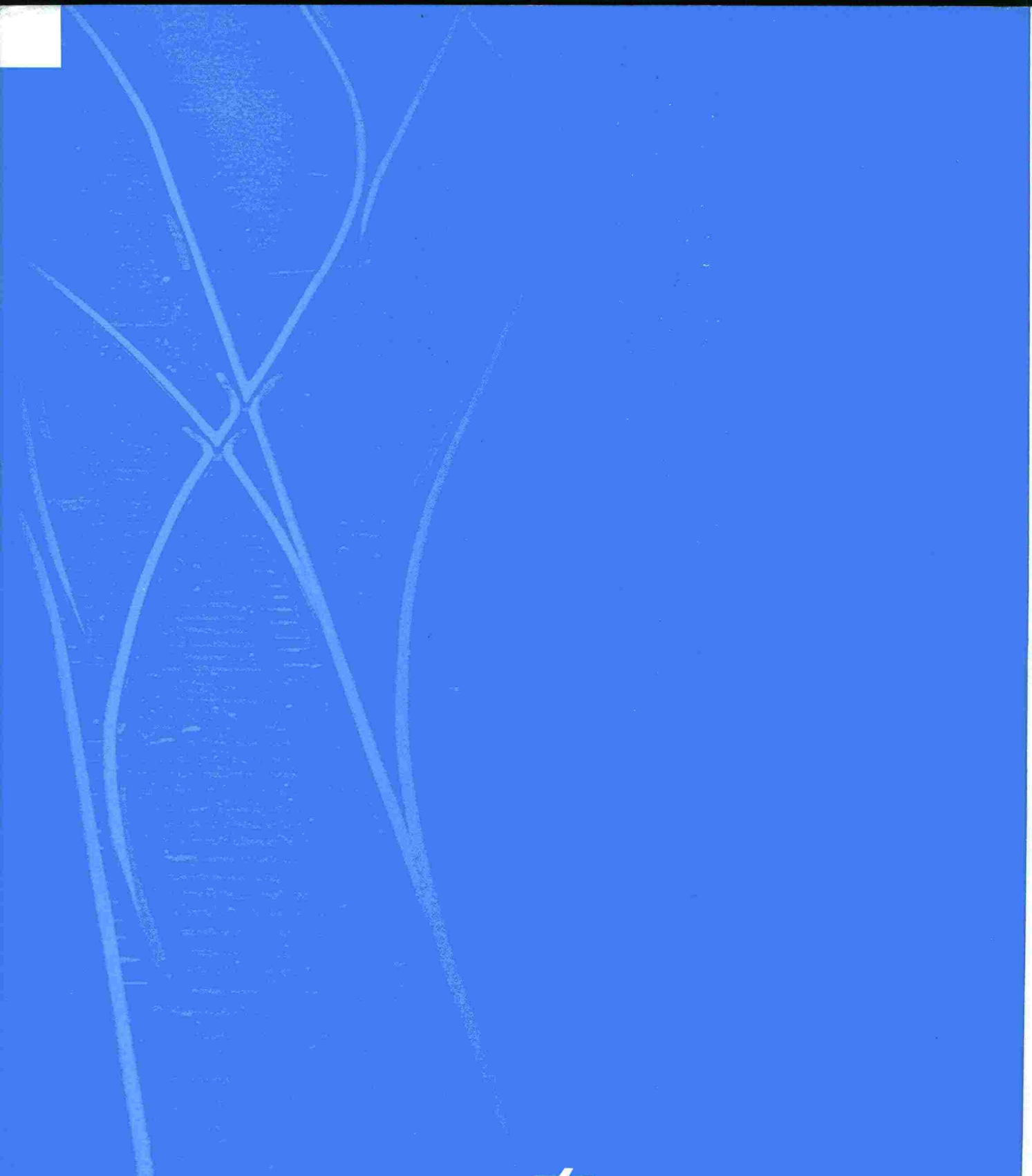

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